U.S. DEPARTMENT OF COMMERCE
National Technical Information Service

JPRS-WST-84-032

WEST EUROPE REPORT - SCIENCE AND TECHNOLOGY

Joint Publications Research Service
Arlington, VA

Sep 84

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25 September 1984

WEST EUROPE REPORT
SCIENCE AND TECHNOLOGY

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AEROSPACE

NEW ESA DIRECTOR ON ARIANE, SPACE STATION, FUTURE TRENDS

Stuttgart FLUG REVUE in German Jul 84 pp 32-33

[Interview with Professor Reimar Luest, new general director of ESA, by FLUG REVUE: "Journal: International Aeronautics and Astronautics: New ESA General Director--A Tightrope Walk for Europe"; date and place not specified]

[Text] Europe's space flight is celebrating its 20-year jubilee. What are the prospects for the future? FLUG REVUE spoke with the new ESA general director Professor Reimar Luest who takes up his office on 1 September.

FLUG REVUE: In the years of its founding the European Space Agency (ESA) had three underpinnings. These were the Ariane, Spacelab and communications satellite programs which have now been largely finished. What are the prospects for the future?

Luest: I believe that the ESA will continue to be based upon these three programs. That is to say that any future program must also encompass the following elements: a scientific program, a program involving applications satellites and a program which assures the continued development of European space vehicle capacity.

FLUG REVUE: The Max Planck Society whose president you were up until your present appointment has concerned itself in astronautics exclusively with scientific experiments in fundamental research. Should it be inferred from your selection that this area will receive very much more emphasis within the context of the ESA programs?

Luest: No, ESA can continue rationally only if all interests of the member states are taken into account. These interests are very various. That means that one must have a balanced program. On the other hand it is actually clear to all participants that the science program is too small. That is the consequence of the so-called package deal in 1972. But developments have shown--because progressively larger and larger scientific satellites are also involved--that here something must be done by the member states.

FLUG REVUE: Some countries, especially the FRG, have introduced a new trend in their space policy. The original dismantling of national programs in order to favor the ESA programs is now being followed by a reconsideration of each

nation's own interests. Will this have a negative effect on joint European goals?

Luest: Really it is a problem of just how large the budget for astronautics can be in a given country. I have always contended both in the founding of the ESRO and also later in the ESA that for a large country like the FRG, for example, it makes sense for it to have its own program in addition to its participation in the ESA.

FLUG REVUE: But doesn't that create the danger that commercially interesting applied programs will be lost by the ESA?

Luest: No, I don't have any worries along that line. Just take, for example: the entire earth exploration program is still at a stage in which it would be more logical for it to be carried out by ESA--both because of the size of the operation and also because it is still not ready for commercialization. Naturally, just as in the case of the American Landsat we hope that it will be possible to take this ultimate step of commercialization. But right now we are by no means that advanced. If you look at our ERS-1 project (European remote sensing satellite) then you see that that is a satellite in which new technology is still under test.

FLUG REVUE: In the area of manned space flight the interests of safety must already call for high cost. Critics want to limit the program entirely to automatic platforms. How do you feel about that?

Luest: I am convinced that you need both. Even if it were only for repair or parts replacement in satellites--an area which can acquire great importance, especially for scientific satellites--manned flight would be desirable. Just consider the space telescope which is to be launched in 1986. Its lifetime is to be 20 years. Within this time it is going to be necessary to change sensors and other parts. I cannot imagine that this could be done by robots.

FLUG REVUE: NASA has thrown a hook out to Europe with the aim of securing participation in the planned U.S. space station. Even back in the days of Spacelab it was found that after its development there was a lack of money for its utilization program. How can you avoid that situation in the case of the space station?

Luest: The politicians must know that whenever one makes a decision in Europe in favor of participation this cannot be done within the present confines of the ESA budget. Additional funds are necessary. It makes no more sense to take money away from the other programs than it does to have a participation in which it is not possible to make wise use of the space station when the time comes. One thing should not be forgotten: the infrastructure which is needed for participation in the space station program, for example, ground stations in Europe, will also give rise to substantial costs.

FLUG REVUE: If one considers the innovations actually gained by the national economy--hopes nurtured by the results of the first Spacelab flight--does this suggest to you the possibility of an alternative to participation in the space station?

Luest: The evaluation of the Spacelab experiments has still not been completed. Therefore it is still not possible for me to make a judgment. However, it is important to note that if Europeans participate in the space station they must have their own package of tasks.

FLUG REVUE: If one takes a look at the vehicles then one sees that the European Ariane began to compete with the Space Shuttle a long time ago. France is pressing for a decision to build the Super-Ariane 5. But for large structural components, elements for space stations or large telescopes Europe, however, will still have to turn then to shuttle services. So would there be any value at all in a development beyond the Ariane 4?

Luest: The past has shown that it was right for Europe to carry out its own vehicle development. Just to imagine ourselves fully dependent upon another country in a commercial domain like that of communications satellites certainly shows that the decision taken was the right one. We can't interrupt this development now because if we did then in 10 to 15 years equipment would be available reflecting the technical state of development existing today. The program must be carried forward within a logical framework and for this reason the ideas of the French seem to me to be highly questionable.

FLUG REVUE: Then what must the ESA budget look like in the coming years if the prospective programs are to be realizable?

Luest: That will be a problem for the coming months. An effort should be made to possess at the latest by the spring of 1985 a balanced program for the next 10 to 12 years to guide the ESA in its work. The problem of the ESA in the last 2 or 3 years was simply the fact that people were living from hand to mouth and did not have a really definite program.

FLUG REVUE: Does that also mean that decisions regarding the space station and Ariane 5 must wait that long?

Luest: That is naturally one of the problems which the Europeans have in any agreement with the Americans. The Americans would like to have a very quick answer regarding the space station while the Europeans need time to weigh the question. I could well imagine that the politicians will say: In principle we find it right that Europe should go along there and that the ESA should get a contract to study in the next 2 years the question as to just what our contribution could look like. And I would imagine that only then would there be a decision. The same applies to the Ariane 5. Right at the moment the only pressing need for a decision has to do with the hydrogen propulsion plant (HM 60) which is to be developed. Here, too, we have enough time and the final decision can be made later.

FLUG REVUE: Up to now the European space program has lacked spectacular goals such as the moon landing was or today's space station is for the United States. The Max Planck Society is participating in studies for a Mars automoton. Could you imagine, for example, something like an unmanned Mars landing as a part of an independent European space flight program?

Luest: Certainly I wouldn't have any idea where the money for such a program could possibly come from. It is true that the question has been asked whether there might not be an agreement between the United States and Europe on such a mission. But there would have to be additional money for this and up to the moment I have not been able to see how such an expensive undertaking could be financially feasible.

FLUG REVUE: The time has long since passed in which space travel could be justified purely on the basis of adventure and fascination. What arguments are there to convince the taxpayers of the innovative power of space flight technology so far as the entire national economy is concerned?

Luest: First, to my mind, is the area of communications technology. Within 10 to 15 years development has taken place which previously no one could have imagined. Another example is weather prediction. It is only with the aid of satellites that we can procure the data required as initial conditions in such complex calculations. Then there is the entire question of earth observations. The possibilities here are still far from being exhausted. And there are still numbers of other examples in the applied area. To be quite plain about it, I can no longer imagine a modern industrial development without knowledge gained from astronautics. Lately there has been much appeal to the example of Japan. But I believe that the Japanese have given serious consideration to these ideas.

FLUG REVUE: In preparation for the imminent decisions the ESA management will be conducting a number of important conversations even in the period before your official entrance into office on 1 September. Will you be involved in these conversations?

Luest: I have already begun to take part from time to time in the meetings of the heads of ESA and I am consulted in connection with all important questions. In addition through visits to the most important European centers and visits to NASA I am trying to establish a personal image so as to be properly equipped--insofar as this is possible--on entering upon my duties.

FLUG REVUE: Space is also increasingly becoming an arena for military interests. Can the ESA keep aloof here indefinitely?

Luest: Simply by virtue of the fact that Switzerland and Sweden are members of ESA and also in view of the fact that it has been set down in the ESA convention that ESA is to serve peaceful purposes exclusively, the correct direction of ESA has already been prescribed in this respect. I consider that there is no possibility of the ESA's becoming involved in military developments. Naturally the possibility that know-how which enters into industry through ESA contracts shall be used for other purposes, for example, within the context of European defense, is something which I cannot exclude.

8008
CSO: 3698/560

AUTOMOBILE INDUSTRY

RESULTS OF ITALIAN RESEARCH IN HIGH POWER LASERS

Turin ATA-INGEGNERIA AUTOMOTORISTICA in Italian May 84 pp 324-329

[Excerpt from a report given to a meeting on lasers at FAST in Milan from May 26-27 1983 by Gian Franco Cirri of Valfivre Inc.: "Presentation of the results of the Finalized High Power Laser Project of the National Research Council."]

1. Light mechanical applications

[Text] The research activity undertaken in the framework of the subproject on "Light Mechanical Applications" is nearing completion. The basic objectives set forth have in large part been attained.

In particular the national industry which uses mechanical methods to process metallic and non-metallic materials of controlled thicknesses will now have available numerous and complete technical and economic data on the possibilities of laser tools as an alternative to traditional processes.

The technological data bank set up for that purpose and enriched by information drawn from all sources of knowledge on a world level, and especially collected from direct experimentation, thus enables the potential industrial user of laser technology to make the necessary technical and economic evaluations and comparisons with respect to a given productive process.

The "laser centers," institutions of research and direct experimentation organized and created to that end, are open today and prepared to receive the industry's questions and problems and to carry out specific testing.

In the course of the evolution of the finalized project the number of laser centers and of agencies which have carried out this experimentation has grown steadily:

-Valfivre S.p.A. Laser Center - Florence

-LAME (Metal Processing) Laser Center - Turin

-Bari Laser Center

-RTM (Institute for Mechanical Technology Research and for Automation) Laser Center - Vico Canavese - Turin

-CISE (Studt and Experimentation Information Center) - Segrate - Milan.

These centers make use of laser systems and sources largely of Italian construction (Valfivre S.p.A.) and operate with trained personnel.

Other organizations have operated along parallel lines with the laser centers in basic research or systems development, such as:

-The Physics Institute of the University of Bari

-The Technological Institute of the University of Naples

-PRIMA projects

-SOITAAB

The main research activities are the following:

1) Basic technological analysis which, through the theoretical analysis of the phenomena of interaction between laser radiation and materials, has developed into the methodical research of the processing conditions of non-metallic materials, such as ceramics, glass, plastics, rubber, wood, textiles and composites and of ferrous and non-ferrous materials of very fine thicknesses.

2) The development of specific systems for the execution of given operations such as cutting and marking by laser.

3) The compiling of documentation and the establishment of a technological data bank for the use of industry.

4) Study of security standards related to laser operations.

Many processes have been studied and perfected and the effective fall-out on the industrial world has been considerable, confirming that the remarkable flexibility of this new tool are perfectly adapted to the new high technology, nearly automated production processes.

In the illustrations some examples of processes experimented and perfected in the course of research with appropriately developed laser systems are shown.

Photo Captions

1. p. 324: The DBC 500 system for cutting plywood with punchers . The CO_2 source of 500 W, the 1.20 x 1.60 cutting table, the numerical controls.

2. p. 324: The plywood cutting operations with punchers by the Valfivre system.

3. p. 325: The LIS 500 F Valfivre system, 500 W, IDRA/CS numerical controls for trajectory marking at constant velocity. Digitalized table for trajectory learning.

4. p. 325: System for the incision and perforation of LSD ceramic substrata with a CO_2 500 W source is the foreground and the COALA 18 numerical controls with letter tape, positioning system with video screen X, precision Y.

5. p. 326: An example of a very high transparency grid obtained from a fine metal leaf by CO_2 laser.

6. p. 326: Titanium microchip with a center hole obtained with a CO_2 (LSD 100) laser. This was done in Valfivre for the construction of an electrical loop isolated from pace-makers.

7. p. 326: Samples of hybrid microelectronic circuits on ceramic substrata at various levels of processing. In some the scribing done by laser is observable.

Heavy Mechanical Applications

[Excerpt from a report given at the FAST laser meeting in Milan from May 26 - 27 1983 by Massimo Castellani Longo of the R.T.M. Institute for Research on Mechanical Technology and Automation]

Objectives:

1) The acquisition of the necessary knowledge required for multi-kilowatt laser applications in technological processes and their transfer to industry.

2) Study of the specific requirements for the project and the achievement of automated systems for laser processes and their transfer to the mechanical tooling industry.

Principal results

With regard to objective 1:

a) Availability of complete data for an evaluation of laser sources for industrial applications and for the choice of same for specific processes.

b) Availability of detailed knowledge in the field of the behavior of materials affected by high energy flux, applied at very high gradients characteristic of the laser beam. This is a metallurgical concept not applied until now to industrial processes, which allow totally innovative applications.

c) Availability of all necessary data processes for applications to the technologies of cutting, drilling, welding, thermic treatment, alloys and applications to non-ferrous and ferrous materials.

Numerous mathematical models are also available which permit an extension of the processes to new applications.

These data represent the result of a systematic experimental plan which has explored a significant range of types of steel and cast iron, some light alloys, some special and superlight alloys, materials derived from powder metallurgy, titanium alloys, characteristic materials and elements of the most diverse agents, compounds.

d) Availability of data relative to experimentation and the streamlining of specific technological processes on real components, with special geometries and requirements.

Of the latter, a remarkable quantity is already applied to production processes or ready for application, and the same quantity is presently being perfected at the request of industrial concerns of every sector.

With regard to objective 2:

a) Availability of specific data regarding optical and mechanical components of systems designed for laser automation. The characteristics of the use of laser beams makes it possible to process at speeds of an order of magnitude much greater than the normal working speeds. This raises new problems for planners, to which the Sub-Project has in many cases found the solution.

b) Availability of prototypes of the optical and mechanical components of laser systems, responding to the specific requirements of the preceding Point a).

The research activities have involved 14 operative units, Universities, research institutes and industrial concerns which have conducted an effective joint research program, thanks also to the efficiency of interdisciplinary study groups, in charge of coordinating and verifying results.

Transfer of results

The transfer of the results of the project to interested users is being carried out by means of all information media generally considered to be valid.

Many meetings and seminars on specific subjects, organized either by the Management of the Project or directly by the Sub-Project, have obtained the participation of representatives of industrial concerns of every size and belonging to the most diverse sectors.

Popularized and scientific publications have been disseminated, some of which have met with a favorable response abroad.

The research structure promoted and provided with resources by the Sub-Project on Heavy Mechanical Applications, the laser center housed at the

Vico Canavese RTM Institute, is open to any industrial user who may obtain assistance and advice for any technological and systems problem.

This center has already carried out projects for more than 40 industrial concerns, also making use of considerable financial sums of the IMI Fund for applied research.

It should be recalled that the endowment of this industrial laser center has no match in size or capacity in Europe: it thus represents a truly unique resource for the industry of our country.

The Sub-Project finally, aware of the fact that the best vehicle for transfer of knowledge is represented by the mobility of people, has obtained from the RTM Institute that a good number of scholarships granted by the latter are awarded for graduate theses on laser technology. Thus today a score of young and able engineers enjoying these scholarships and employed by diverse industries are the best and most conscious agents of dissemination of the results of the project.

Photo Captions

1. p. 327: The medium power laser room at the RTM Institute. On the left: a Valfivre 100 W laser/ a 2.5 W Spectra Physics laser; a 500WCoherent laser; a 500 W Valfivre laser.

2. p. 327: The RTM 15 KW laser with two work posts.

3. p. 328: System for the thermic treatment of cast iron cylinder rods.

FIAT Activity in the Finalized High Power Laser Project

[Excerpt from a report given to the Meeting on the Finalized Project of the CNR power laser, held at FAST, Milan, from May 26-27 1983 by P. Pizzi, L. Pera, of the FIAT Research Center, Orbassano, Turin]

The development of laser applications was begun at the FIAT Research Center in 1972 in the metrological sector with gaseous and solid state lasers.

The techniques of laser beam diffraction were carried out extensively in the study of machine tool processed surfaces and the Moiree techniques in the study of three-dimensional forms.

Some of these techniques have been developed in the firm, especially in quality control of the product.

In 1977 the first power laser activities were begun in the FIAT Research Center with the acquisition of a 15 KW laser plant.

In 1979 construction of the first prototype plant for the welding of the synchronization ring on automobile gear 128 was started.

In 1980 the plant, following final testing, was transferred to production at the Mirafiori establishment.

The collaboration of the FIAT Research Center with the COMAU led to the production of the first industrial plants in the field of welding.

Activities carried out by the Center in the context of the Finalized High Power Laser Project of the NCR has made it possible to develop notable know-how both in the field of optics and the transfer of high power laser beams and in the field of non-equilibrium metallurgy.

These activities have concerned in particular:

- the theoretical-experimental study of casting phenomena;

- models of laser-materials interaction and measurement of the absorption coefficient;

- optimization of optical systems for the transfer of beams over long distance (fig. 2);

- the design of optical systems for industrial cutting and welding operations and thermic treatment.

Photo Captions

1. p. 329: The synchronized gear welding plant operating since 1980 at FIAT Auto-Stabilizer in Mirafiori. The stations are supplied with a 2.5 KW laser beam. The plant was set up in collaboration with the FIAT auto Research Center.

2. Special optics in water-cooled copper used for the transfer at high power to the processing area.

12425
CSO: 3698/562

ELECTRIC PEUGEOT TO HAVE NEW NICKEL-IRON BATTERIES

Technical Specifications

Vienna WIENER ZEITUNG in German 28/29 Jul 84 supplement p 16

[Text] Everywhere in the world the development sections of large automobile companies are devoting their efforts to the electric car. The batteries are usually quite bulky and heavy, so that it is natural to use station wagons or even panel trucks as the first experimental vehicles. In Paris an attempt has been made to house electricals and electronics in a small production car: The PSA company selected the Peugeot 205 and developed a prototype called the "Electrique," which is supposed to go into limited production next year, and is then to be used in short-range operation for large-scale testing.

The precondition for electrifying this subcompact car was a new nickel-iron battery which had been developed by the French battery maker S.A.F.T. In relation to its weight and space requirement, the battery has about twice the capacity of conventional car batteries--230 ampere/hours with a weight of 24 kg. Twelve of these batteries combined in a set weighing 300 kg and located under the "hood" of the 205. They supply a rated voltage of 72 volts.

The car is driven through a 68-volt D.C. motor, whose output varies from 8 to 11.7 kilowatts (11 to 24 hp). With the electronic controls and reduction gearing it weighs 70 kg, so that the total weight of the 205 Electrique is 850 kg, of which 690 kg alone rests on the reinforced front axle.

Top speed is quoted as 100 km/hour. Range on level roads is said to be 200 km at 40 km/hour, 160 km at 60 km/hour and 110 km at 80 km/hour. Consumption in city traffic is given as 107 watt/hours per kilometer, about 11 kilowatt hours/100 km. To these electricity costs must be added the losses that occur during charging of the batteries, which takes 10 hours. The life of the batteries is said to be equivalent to driving a distance of 250,000 km.

The electric car has only two pedals. The amount of current and therefore speed is controlled with the "gas pedal." The brake pedal works through the first part of its travel as a motor brake, whereby the motor functions as a generator and recharges the battery with part of the braking energy. In the second part a normal mechanical-hydraulic brake system also comes into operation.

Since the entire powertrain, along with the batteries, can be housed in the engine compartment, all the interior space and the trunk of the car is available to the operator as in the normal 205.

9581

PSA, CGE Joint Development

Paris AFP SCIENCES in French 19 Jul 84 pp 64-66

[Article: "The Electric Peugeot 205: 20 kWh Per 100 km..."]

[Text] Paris--20 kWh per 100, 100 km that is. This is the power consumption of the electric Peugeot 205, two prototypes of which were just made and presented to the press by the large French automobile manufacturer.

Based on the French household tariff (off-peak hours), that amounts to FF 7 per 100 km... compared with FF 40 or so for a gasoline 203 model, for city driving. And that price is actually the one that should be taken into account as, with an average range of 140 km without recharging, the electric 205 appears to be essentially a city car.

The electric 205 has the same "three-door" body as the 205 GTI, but under its front hood, instead of a traditional gasoline or Diesel engine, it has twelve 6-volt iron-nickel batteries and an electric engine which together weigh 350 kg.

The electric 205 is the first car in the world to have all its electric components forward, so that all the rest of the vehicle remains available (four seats and rear trunk). This was made possible by using more compact nickel-iron batteries with twice the performance and four times the resistance of present lead batteries.

The service life of these batteries is at least 1,500 cycles. On the test bench, engineers have obtained 1,750 cycles (charging and discharging) which, at the rate of 140 km per cycle, amounts to a total theoretical battery service life of 200,000 km or so.

These batteries are the result of a close cooperation between the Department of Research and Scientific Affairs of the PSA [Peugeot Company] group headed by Albert Grosseau, and more particularly the group's Electric Vehicle research unit headed by Claude Peyriere, and SAFT [Fixed and Traction Storage Batteries Company] of the CGE [General Electricity Company] group.

The major stages of the PSA-SAFT research project were as follows:

- 1978: testing of an experimental battery; 55 Ah, 12 V;

- 1980: realization of unit cells; 1.2 V, 200 Ah. Power-to-weight ratio: 50 Wh/kg (3-hour operation); service life: 1,500 cycles;

- 1983: realization of an integral 5-cell unit; 6V, 230 Ah. Dimensions; 244 mm long, 190 mm wide, 280 mm high; weight: 25 kg.

Innovations:

- partition bushings;
- centralized filling system.

This integral unit is now being tested by the PSA group and at SAFT. It is used on the 205, but also on other electric vehicles made by the PSA research unit, C25, J9.

SAFT has already invested FF 15 million in the iron-nickel battery development project; including FF 6 million in subsidies from the AFME [French Agency for Energy Expertise] and the Ministry of Industry and Research.

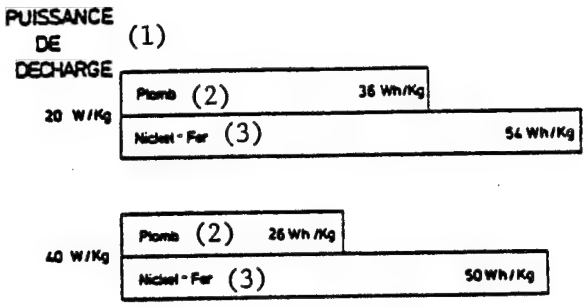
When it starts, the electric 205 may be slightly less responsive than a well tuned-up gasoline car but, having no gearbox, it can accelerate fast. When it starts, the current is "chopped" to respond to the driver's handling. The electric energy flux sent to the engine (DC electric engine with separate excitation coupled to the front wheels through a reducer) is controlled by two "current-choppers." A main (armature) "chopper" with asymmetrical thyristors operates in the lower third of the engine speed range; a transistor excitation "chopper" controls the engine at medium and high engine speeds.

A speed of 50 km/h can be reached in 11.6 seconds. The maximum speed is 100 km/h. Note that 20 percent of the battery energy is recovered during braking.

What future does the electric 205 have? Mr Jacques Fleury, head of the PSA automobile department told the press that "for the time being, this is only a prototype--two units of which were made--which will reach the pre-industrial stage only in about 18 months, if the administration shows any interest."

PSA, which has started negotiations with EDF [French Electricity Company], hopes to sell "a few hundred units per year," the potential market being estimated at 5,000 sedans per year. By experimenting under actual conditions, it should be possible to improve the vehicle progressively, in particular the engine, which is based on a traditional cell and manufactured by Leroy-Somer.

The electric 205 will probably be used essentially as a small utility car for city driving, or as a second car for households which can afford two

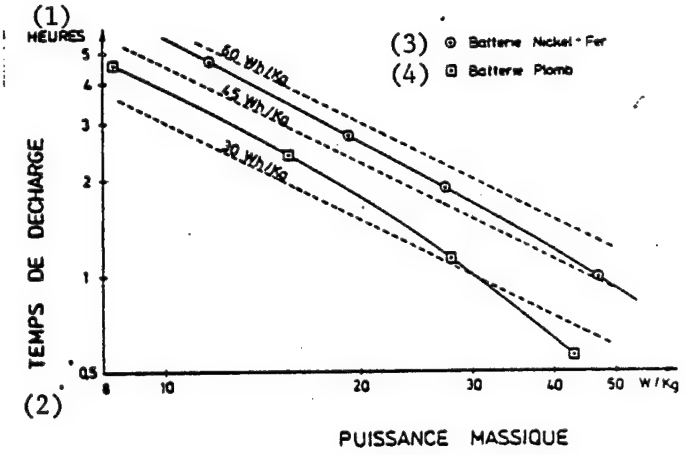


ENERGIES COMPAREES DES BATTERIES NICKEL-FER
ET DES BATTERIES PLOMB

Comparative Power Outputs of Nickel-Iron and Lead Batteries

Key:

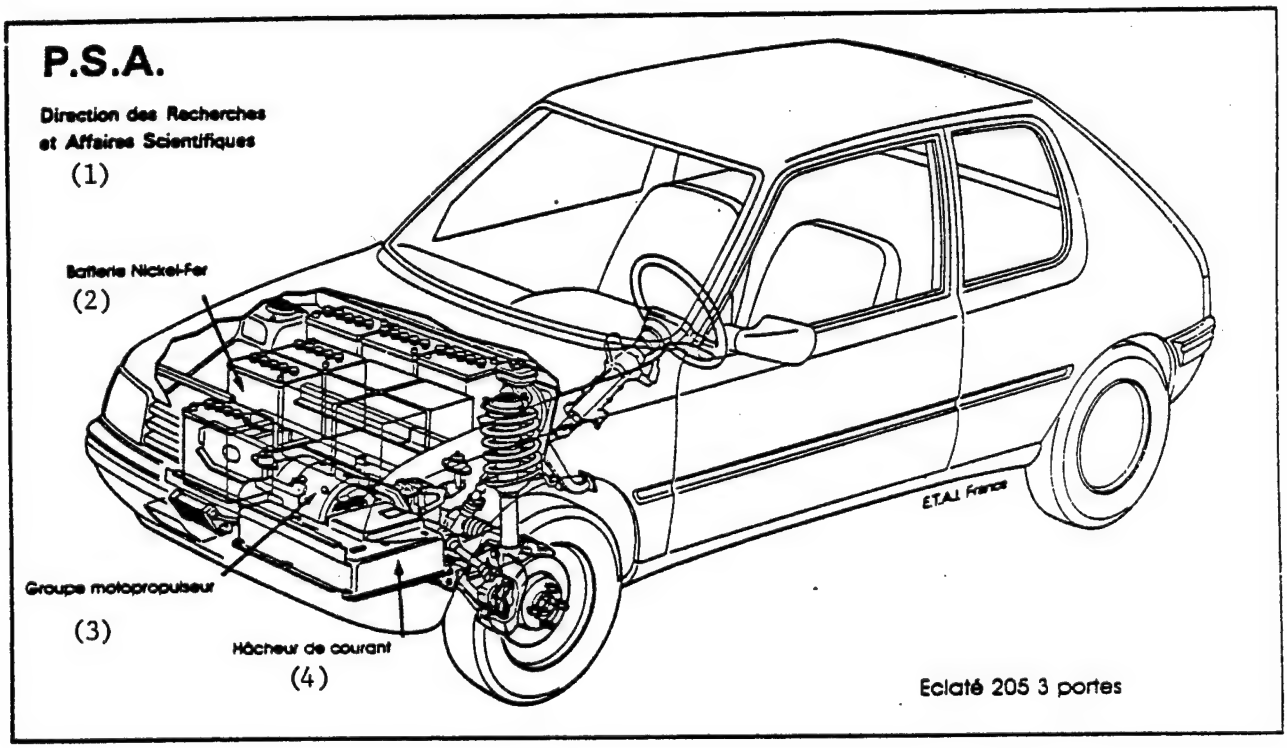
1. Discharge power
2. Lead
3. Nickel-iron



Discharge Time Vs. Power-to-Weight Ratio

Key:

1. Hours
2. Discharge time
3. Nickel-iron battery
4. Lead battery
5. Power-to-weight ratio



Exploded View of the Three-Door 205

Key:

1. PSA - Department of Research and Scientific Affairs
2. Nickel-iron battery
3. Power train
4. Current chopper

vehicles. We should not forget that the car must be parked where an electric outlet is available to recharge it. A garage is therefore a necessity, at least for the time being.

In addition, when asked about the cost of the car, PSA stated that they had "no idea" for the moment. It will be higher than that of traditional cars. All the same, the 205 is "an interesting technical solution," which made it possible to "use electric power for a true low-end vehicle," whereas all such cars made until now were at the two extremes: utility vehicles or highly specific low-end vehicles offering very little room.

Battery Research Continues

Paris LE NOUVEL ECONOMISTE in French 18 Jun 84 p 65

[Article by Sophie Seroussi: "Battery: The End of the Lead Age"]

> [Text] Good-bye to the good old lead battery. Lighter and more efficient, the iron-nickel cell or the plastic cell will start the engines of tomorrow.

Indeed, everything will change, even the good old car battery whose supremacy has been based on lead for the past 100 years. By the end of the month, Peugeot will have introduced an all-electric 205. Powered by a nickel-iron battery, the prototype will have a range of over 100 km and will run at a speed of 100 km per hour. Developed by SAFT of the CGE group, this battery is half as heavy and less bulky than a traditional lead battery. And it lasts twice as long.

Meeting Specifications

"We do not claim to have already found the ideal solution," Mr Jean-Pierre Cornu, director of strategic marketing at SAFT, explained. "The nickel-iron cell just happens to be the first one that will meet the specifications of electric vehicle manufacturers." Actually, its future is directly tied to the future of electric vehicles, and especially that of a new generation of electric engines developed by Leroy-Somer. Thanks to this technology, the potential market of roughly 150,000 to 200,000 vehicles per year in 1990--for France alone--could experience a rapid growth. At least, this is what potential manufacturers hope, and they expect a lot from an incentive policy on the part of the authorities, which should be announced by Mr Laurent Fabius on 26 June at the International Symposium on Electric Road Vehicles. In particular, these incentives could take the form of massive orders to renew the fleets of administrations and public enterprises such as the PTT [Posts, Telecommunications and Television Administration], EDF-GDF [French Electricity and Gas Company] or SNCF [French Railroads].

However, the real industrial revolution will take place in about 10 years, when plastic batteries are introduced. According to experts, "this future battery should be to the lead battery what the transistor was to the vacuum tube." Its principle: to replace lead by simple doped plastics, i.e. plastics that have become electric conductors. These are usually organic polymers of the polyacetylene or polypyrrole families. Simple in design and tighter in manufacture, these batteries would have a power output four to five times higher than that of lead batteries. They could be recharged in 1 to 2 hours instead of 10 to 12 with traditional equipment.

In theory. In practice, all these attempts are only in the experimental stage. In France, the leading domestic battery manufacturer, another CGE subsidiary, CEAC (European Electric Storage Battery Company) with over half the market, is carrying out development work in collaboration with the Atomic Energy Commission and with the blessing of the authorities. These all-plastic starter batteries will be 2 to 3 times lighter than at present

and will enable small "3 liters/100 km" cars to achieve substantial energy savings.

A utopia? Not really. The Japanese (Asahi Chemical, Sumitomo, Toray), the Americans (Allied Chemical, IBM, Rohm and Haas) and the Germans (BASF, Bayer) achieved their first successes already a few years ago. The main difficulty is that the plastic should not only become a conductor, but that it should also be able to charge and discharge electricity as required. CEAC (FF 1.3 billion in sales in 1983) counts very much on this new technology to impose its leading brands--Fulmen, Tudor, Dinin--against imports. In France, about one third of the 8 million of batteries sold annually are of foreign origin. That is lot for a market of FF 1.5 billion, which is traditionally held by automobile equipment manufacturers. The second leading company, CFEC (French Electrochemical Company) shares three fourths of the pie with CEAC. Therefore, they are not too happy to see new competitors enter the market. Even and especially... if they belong to the same parent company. The world leader in aircraft and railroad batteries, SAFT (FF 2.6 billion in sales in 1983) is equipping 50 percent of the civilian and military fleets, including Boeing's. And it does not want to lose the electric-vehicle market. This is an irreversible technological trend, although the lead battery may not have said its last word. Manufacturers are positive that they can reduce its weight and increase its capacity. And they point out that the price of lead does not change much.

LES ECHOS Comment

Paris LES ECHOS in French 3 Jul 84 p 7

[Article signed G.B.: "Electric Vehicles: Betting on Nickel-Iron Batteries"]

[Text] Batteries of nickel-iron cells could well revolutionize the electric-vehicle market... especially in France where that market is still non-existent. Indeed, if the authorities and the AFME (French Association for Energy Expertise) did spend some FF 6 million over several years on projects to improve vehicles of this type, they never really tried to create a market by means of orders from administrations or large public fleets (EDF, PTT).

This could change now that new nickel-iron batteries have been developed by SAFT. Their service life is 4 times that of traditional lead batteries, and if they last for 120,000 km now, further progress is expected and their service life could be increased to 160,000 km by 1990.

Therefore, it is not by chance that Laurent Fabius recently invited EDF and the PTT to equip themselves with electric vehicles.

However, to achieve the mass-production savings required, the French market would have to absorb 10,000 utility vehicles or 20,000 cars powered by electricity by 1990. We are far from these figures, since EDF and the PTT are not expected to order more than a few tens of vehicles in a first stage. At least, these orders will make possible testing under actual conditions. For the future, SAFT is counting not only on the large-fleet market, but also on the second-car market in large towns.

Not Just French Stakes

For the time being, this technology is still costly: it takes FF 20,000 to equip the Peugeot 205 with an electric propulsion system, and FF 30,000 to equip a light utility vehicle of the "Master" type. However, a new production unit could be set up, and 600 jobs created. At first, the nickel-iron batteries will be produced in Bordeaux, therefore not far from the Leroy-Somer Angouleme plant where the electric engines are manufactured.

It is quite obvious now that, following the nearly irreversible process that is the rule in dealing with energy problems, the electric vehicle will have its hour of glory. The main problem for French manufacturers is to be ready when the demand manifests itself. And the stakes are not just French: large potential markets should appear abroad.

There remains one handicap: cheap nickel supplies, but that is largely a political problem.

9294
CSO: 3698/577

BRIEFS

HYDROGEN-POWERED VEHICLE--An experimental vehicle that runs on hydrogen was unveiled on 17 May by the Swiss Federal Reactor Research Institute (IFR) of Wuerenlingen (Argovie Canton). The vehicle, dubbed "Auto-Mth" (short for Methyclorhexane, Toluene, and Hydrogen), and which performed splendidly in its first tests, emits no exhaust except water vapor, a trace of air, and a trace amount of oxides, but no carbon monoxide. According to the IFR, that makes it a "world first." IFR claims that with 0.35 kilos of hydrogen, it delivers the same power as a conventional engine on 1 liter of gas, for a price about twice as high. Maiden tests were run with a 17-ton truck and "showed no serious weaknesses," according to IFR. Over the next 2 years, a truck or a bus is to be built with the MTH system and tested on Swiss roads. [Text] [Paris AFP SCIENCES in French 24 May 84 p 79] 6182

CSO: 3698/570

DESCRIPTION OF RUGGED CN-235 COMMUTER

Stuttgart FLUG REVUE in German Aug 84 p 64

[Article by Hellmut Penner: "Technology: Research and Development News: European-Southeast Asian Commuters--The Casa/Nurtanio CN-235 Is a Plane That Can Take Punishment"]

> [Text] The European Economic Community project CN-235 has been designed as an extremely durable aircraft. The 39-seat plane has been conceived for commuter and utility use. It was for the CN-235 that Casa and Nurtanio founded the Aircraft Technology Industries Company.

Both the Casa Company in Spain and also the young Nurtanio Company in Indonesia have since their beginnings conducted no developments on their own direct initiative. Before the founding of the Aircraft Technology Industries Company there had already been close cooperation between Casa and Nurtanio.

For several years now Nurtanio has been manufacturing in its own plants the utility aircraft C.212 Aviocar developed originally by German engineers.

Since then this machine has been used successfully in the Southeast Asian area in addition to other areas. The C.212 has been primarily conceived as a transport aircraft for light duties. The development of the CN-235 European-Southeast Asian aircraft has been along the lines of a similar concept. As may be seen in the accompanying elevation and plan views the airplane has not been designed as a pure passenger aircraft.

Customers for this type of "commuter airplane" will have to be sought primarily in Third World countries because in the Western world other views prevail regarding the use of aircraft performing both commutation and transport tasks. Thus the mass-production provision of a tail loading entrance not only increases the cost of a pure passenger version but it makes the aircraft generally expensive and cost-inefficient. On the other hand a pressurized fuselage is not absolutely necessary in a medium-weight transport plane.

Insofar as civilian use has been planned--this could, for example, mean a mixture of freight and passengers in the Asiatic area--the convertible setup consists of 22 seats with an additional seat for a flight attendant, a toilet, a

kitchen and a separate area for two LD 3 containers. The purely freight version provides freight space for four LD 3 containers. The CN-235 can also accommodate two Jeeps in the military version or 18 hospital stretchers.

The project has thus far been extraordinarily ambitious. The Casa Company itself has for many years possessed suitable manufacturing facilities. But on the other hand in the case of Nurtanio it was first actually necessary to acquire the land on which manufacturing would take place. Machine tools, partially purchased in Germany, first had to be procured in distant Bandung. Also a fairly long learning process is required before the machines can be optimally used there.

Two Airplanes Are Undergoing Flight Tests

At the present time one of the machines in Spain and another in Indonesia are in an advanced stage of flight testing. The preparations for mass production are fully under way. In addition to 110 orders there are around 2 dozen options current.

The aircraft has to a large extent been developed in accordance with conventional structural techniques. Nonload-carrying structures, rudder components and aileron parts are constructed of fiber compounds based upon Nomex honeycomb material and glass fiber.

Completely new are the two General Electric propeller turbines each producing 1,700 HP. Also, they drive newly developed Hamilton standard four-blade propellers. The fuel tanks carry a total of 5,110 liters which results in a range of 796 km.

This 13-ton bird requires a takeoff distance of 415 meters and a landing distance of 340 meters. Its climbing power is a respectable 9 meters per second. Its service peak altitude is 28,500 feet. The cruising flight speed at 15,000 feet is given as 454 km/hr. Its highest possible cruising speed is expected to be as much as 509 km/hr at 20,000 feet.

As these few performance data imply (which at the present time still have to be demonstrated individually in flight) the CN-235 is superior to almost all other aircraft of this category. Admittedly the plane is not designed for long distances. It will be used primarily in short-route operation or for battle zone transport.

Its robust undercarriage which would have to be able to operate on the roughest runways is a development of Messier-Hispano-Bugatti.

New dimensions are provided for the cockpit crew. Unlike traditional transport planes of this size there is no seat for the third crew member. It is true that the prototypes at the present time are still equipped with conventional technology but the control panels will possess the most modern CRT systems, at the very latest in the mass-production version.

In this respect the developers are following a trend which had already been initiated in commuter aircraft such as the SF-340 and ATR-42. Also the ergonomic design is based upon the most up-to-date knowledge. The CN-235 is considered to be an all-round "pilot-friendly" airplane.

There are similar prospects for the passenger. He enjoys the advantage of sitting below the wing which permits an unobstructed view out of practically every window. Just to what extent the noise problem in the plane of the propeller has been successfully dealt with remains to be seen. Embarking and disembarking takes place via a short retractable stairway.

The tail loading ramp is placed in a very low position and thus provides for very easy cargo stowage. But it can also be opened in flight to discharge parachutists. Since the CN-235 wing also permits higher wing loads thought has been given to possibly extending the aircraft fuselage at some later time. This could result in a capacity of about 60 seats.

It is understandable that cooperation over thousands of kilometers should be not without its problems since each company has its own final assembly and each manufactures different structural groups which must reach their destination by ship.

And so it is not only in terms of its flying qualities that this airplane can take punishment.

8008
CSO: 3698/589

CIVIL AVIATION

MBB EXPANDS 'CADAM' SYSTEM FOR A 320 PROGRAM

Stuttgart FLUG REVUE in German Aug 84 pp 82-83

[Article: "A 320 Design: Computer Aid for Aircraft Builders"]

> [Text] About 100 monitor screens are being used at MBB for the new Airbus. The pressure of competition necessitates such methods.

As a result of heavy competitive pressure and ever shorter construction time allowances MBB has recognized the urgency of expanding the capacities of the CADAM monitor workplaces in the building of passenger aircraft and transport aircraft by employing additional terminals and enlarging computer memories. For the first time in the history of European civil aircraft construction an airplane, the A 320, has not been designed on the drafting board. The monitor screen, light pencil and computer together with a keyboard and plotters and magnetic tape recording devices are now the only tools of design engineers.

The smallest sheet metal parts can on command be extracted out of the entire structure and designed in detail. The memory banks retain the "ideas" until they have been "frozen." Then on command they release the data to the plotter in any desired scale. By means of transformation parameters it is even possible for views to be juxtaposed in space in such a way as to project apparently three-dimensional pictures for a better understanding of the design.

In addition to the substantial gain in time another feature of the highest importance is a substantial improvement in accuracy. The more exact drafting representation helps even in the preliminary stage to avoid mistakes which might, for example, arise on the drafting board as a result of an incorrect scale calculation.

A further even greater advantage is provided by the system for drawing modification. If a modification is introduced through the CADAM system then automatically the corresponding corrections are transmitted into all subsequent drawings.

Data transfer through data channels can take place from design to finished manufacture without any loss of time. Thus there is a total elimination of laborious modifications of blueprints and obligatory redrawing.

Also in the case of the Airbus A 320 the construction of manufacturing fixtures is for the first time fully included in the aircraft design. At the present time the definition phase is considered to have been completed. On the basis of tail empennage construction phases in which MBB is involved, construction groups are now formed which in a succeeding detail manufacturing phase lead to the production of individual parts.

Individual parts such as complicated milled parts can in the future be designed on the monitor screen in the Hamburg plant. After that via a data channel they arrive at the central MBB machining plant in Varel as a control command for the numerically controlled automated milling machines.

In addition the traditional blueprints at the workbench are being replaced by microfilm reading equipment. The microfilms are rapidly accessible and may be reproduced at any time. Exchange of data with the other Airbus partners also guarantees absolutely perfect maintenance of dimensions for the final assembly. Thus in the case of highly accurate connecting elements tolerances are automatically matched.

Up to now CADAM installations have been used only tentatively or in very special applications. However, the miniaturization of computers and the ever increasing abundance of software have now resulted in cheaper facilities of this type.

8008
CSO: 3698/589

LIGHTNING-SAFE CARBON FIBER COMPOSITE FOR AIRBUS TAIL UNIT

Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT 1 Aug 84
p 6

[Article: "New Airbus Empennage in Lightning-Strike Test"]

[Text] Wg. Hamburg. Airplanes with large-area structures of graphite-fiber composite materials (CFK) fly with absolute safety even in storms. This was demonstrated during a recent series of lightning-strike tests on an Airbus-A310 vertical-tail spar of the Airbus material developed and built by Messerschmitt-Boelkow-Blohm GmbH (MBB) in Hamburg and Stade. The 300,000-volt lightning bolts were generated in the Institute for Plasma Physics at the University of Hannover.

A portion of the vertical-taol spar of the Airbus A310 was fabricated at the MBB factory in Stade for the lightning-strike tests. Lengthy studies by MBB and test measurements on CFK samples in the Institute for Plasma Physics have shown how to design for safety from lightning strikes. The tests on the CFK vertical-tail spar included direct and indirect effects. Direct effects include mechanical damage such as holes in the material and melted rivets; the indirect effect is the coupling of the electro-magnetic energy of the lifhtning into the aircraft's electronic circuits.

Since it is not possible to generate in the laboratory or in field tests the strongest lightning discharges occuring in nature, amounting to several million volts and currents up to 200,000 amperes, the lightning discharges were simulated at lower voltages in the tests. Only the currents flowing in the airplane are relevant for damage. Besides the instrumentation, the test facility in the Institute for Plasma Physics consisted mainly of current inpulse generators. The number and magnitude of the current impulses which are required for demonstrating the flight safety of CFK structures are topics of current international deliberations.

The evaluation to date of the lightening-strike test results on MBB's Airbus empenage at Hannover University's Institute for Plasma Physics shows that both the direct effect on the plastic structure and the indirect effect on the electronic equipment inside the CFK component resulting from a

lightning-strike are insignificant. The CFK structure suffered only minor damage even under the most unfavorable condition of a direct strike at an angle of 90 degrees to the surface of the structure. The test series has clarified how the electrical components--antennas, antenna tuning units, rudder position transducers, hydraulic system monitoring units--can be arrayed and mounted inside the structure to survive a lightning strike intact and without damage.

9160
CSO: 3698/593

PHILIPS DEVELOPS FACTORY AUTOMATION SOFTWARE

Paris L'USINE NOUVELLE in French 26 Apr 84 pp 40-41

[Article by Jacques Antoine]

> [Text] This is the first software designed to expand and manage systems incorporating several micro-computers operating in real time. These are the complex systems needed for industrial and scientific automation.

Automation of processes and machines in industry and in laboratories, along with acquisition and analysis of measurement data, have created a demand for software that can out-perform what is available on the market. A response to that demand comes from systems incorporating a number of microcomputers arranged around a communications bus. Since each small computer must perform one or more tasks in real time, the control software required is perforce complex. Having it made to order by the computer and electronics division of the major manufacturers (people who build robots and digital controls, etc.), then getting the bugs out of it each time more capability is called for, takes a lot of time and costs more money every time you price it. "Adding one processing card to a system means a week's work writing the program," says Andre Peeters, who heads Philips' international products division. Think about that and you see why the research team at Philips set about developing the software for a distributed multi-computer system, the first of its kind. It is called the DRM system (short for Distributed Real-Time Multiprocessor).

"This software system, which can manage several central units, controls the performance by each of them according to the program to be applied. It also suggests a procedure for building reliable computer groups with distributed intelligence, for real-time applications."

Current procedures require that the equipment in which the software is to be installed be available at a very early stage in the design process. Specifications for this equipment (digital cards, system architecture, peripheral equipment) must be ordered at practically the same time as the design process begins, which means that there

is every reason to make certain it is right the first time. If it is not, you have to go back and start all over again.

"One of the essential features of the DRM system," explains Andre Peeters, "is its independence of hardware. It lets you develop and polish your application program before selecting the final hardware configuration, which means you can test it out until you're absolutely satisfied." Result: software application modules that you can simply plug into each of your microcomputers.

It's not quite so independent as all that, this Philips software, since it is compatible only with the Motorola 68000 microprocessors and for systems using the VME bus. Of course. But, as we were told by Jean-Claude Fos, who is head of Philips' science and industry products, "This 68000 family in 3 years has captured more than 25 percent of the market for 16-bit computers and offers a way to evolve toward 32 bits. As for the VME bus, it has become the quasi-standard adopted by more than a hundred manufacturers."

That makes the option Philips has picked more understandable. It is a choice that could still find an even broader industrial base if the negotiations now under way at Eindhoven, The Netherlands headquarters, with Mostek and Motorola.

6182

CSO: 3698/570

EUROPE'S PRIMARY PRODUCERS OF INDUSTRIAL LASERS SURVEYED

Bern TECHNISCHE RUNDSCHAU in German 31 Jul 84 pp 17-19

[Article by Hanns Benninghoff: "Cutting With Lasers--a Superior Technology"]

[Excerpt] Control Laser, Great Britain

This firm's particularly elaborate multiaxial laser machining centers carry out zonal and selective heat treatments. They cut materials in the form of plates, tubes, and three-dimensional objects. In terms of power output, control system, and design they offer numerous alternatives for accommodating a multitude of user requirements.

The alternatives in the design permit laser nozzle movements in two to five axes while the laser and the workpiece remain stationary. A five-axis design permits a turning of the nozzle through 360° horizontally and 90° vertically in addition to the linear horizontal and vertical movement. Furthermore, a biaxial work-platen movement is possible as well. CO_2 lasers with power outputs of less than 1 up to several kilowatts are incorporated in these systems. Depending on the requirement, the systems can be integrated with optical line sequential manipulating units or workpiece manipulating units and can be equipped with a complete CNC [computerized numerical control] unit. The optical line-tracking unit makes it possible for the shapes of line drawings or pattern templates to be accurately reproduced on biaxial or triaxial contour cutting machines.

Ferranti, Scotland

Ferranti has had the successful principle behind the MF 400 followed by a new laser in the kilowatt class. The MFK CO_2 laser generates a maximum power density of 3.5 MW/cm^2. It can be focused to 0.2 mm. Especially noteworthy is the built-in recovery system for the laser gas. In contrast to other CO_2 lasers, only small amounts of CO_2, nitrogen, and helium need to be subsequently measured out. This has a cost-saving effect. Figure 3 [not reproduced in translation] shows the approximate cutting speeds.

IFW Institute for Production Engineering of the University of Hanover, Germany

On the laser machining system of the IFW, which includes a 500-W CO_2 laser unit, coordinate table, and biaxial CNC continuous-path control, research work is being carried out with the objectives of rectifying errors of form, dimension, and position in the laser cut and determining and reducing the thermal effect on the cutting zone.

Investigations of cutting processes are carried out as a service for potential and actual laser using firms. To date, practical experience has been gained from the working of structural and deep-drawing steel, austenitic materials, aluminum, zinc, and tantalum, as well as of non-metals such as graphite, acrylic glass, corundum, mineral wool, glass fibers, and elastomers. These investigations use a scanning electron microscope for the microgeometric analysis, an X-ray diffractometer for the internal-stress analysis, and in addition devices for the measuring of roughness, microhardness, and macrohardness, as well as grain structure.

Companies are given the opportunity to have their specific machining jobs tested for suitability for laser handling in a neutral application laboratory. The offer to render such a service includes in addition the drawing up of a cost comparison with the procedure used previously. This includes, in addition to capital expenditures, operating costs, and essential operating times, also the utilization of materials, the tool costs (absent in the case of lasers), altered idle-machine times and setting-up times, and any preworking or reworking which may arise or which is done in addition.

Laser Work, Switzerland

The name Laser Work encompasses laser system construction, commissioned production jobs, and research and development in the working of materials using lasers. The focal points here are CO_2 laser system building and job work for a great variety of customers. But the foundation for its business success lies in user-specific research and in further product improvements.

The "favorite child" at Laser Work has the model designation LW 147 C. This laser cutting machine operates according to the principle of movable cutting optics. Here the laser unit is fixed, and the workpiece does not move either. The beam of the CO_2 laser is conveyed to the cutting head via mirrors, with protection provided by passage through a channel. In this design the small masses moved permit both a maximum acceleration and also a maximum traveling speed. And even with a large work area only a relatively small floor space is needed. That is, the extra areas added to the overall workspace are merely those occupied by the cabinet for the laser and the CNC control. Normally this system is controlled by a biaxial up to four-axial CNC continuous-path control. Here a matching electronics monitors the overall system and permits an adjusting of the laser-specific values.

The field of application of this machine is mainly the cutting of sheet material. But an especially well-thought-out mounting system for the

workpieces also permits the machining of hollow pieces and tubes. These machines can be automated further. Automatic sheet and workpiece feeds make it possible to use these laser cutting systems in production lines. A pulse control system for drilling and perforating work can be provided. Also a part of the range of accessories offered is a pipe-cutting attachment for cutting to dead lengths and for cutting out piercing holes. Figure 6 [not reproduced in translation] shows an example of such machining.

The system LW 453 B is a standard component of an automatic production line in equipment and auto-body manufacturing. In the case of small batches above all, the cutting out of complicated shapes before deep drawing requires a large proportion of operations scheduling, which is streamlined in an advantageous way by numerical control methods. The laser cutting equipment works in a manner similar to a computer plotter: Sheet metal of thicknesses typically 0.8 to 2 mm is fed intermittently to the laser system from an untwisting machine with an attached straightening mechanism. As soon as a corresponding control signal from the CNC control unit calls for sheet, the decoiler and the attached straightening mechanism start up. At the same time and synchronously with the advance of the sheet, the segmented belt of the laser system moves forward and carries the already cut parts out of the laser cutting area for further processing.

Messer-Griesheim, Germany

In the future its high-grade machining process using lasers and electron beams will be assuming an even greater importance. Besides its already established electron-beam technology, Messer-Griesheim is now offering also an elaborate laser program at its Steigerwald Beam Engineering Plant. Supplementary to this there is also a laboratory for laser application techniques at Steigerwald.

Practical demonstrations at the site permit a better idea of the manifold areas of application of the two beam methods and their respective advantages and disadvantages.

In order to produce recesses, openings, and holes for branchings in pipe parts, for the most part punching tools, saws, and milling cutters are used. This mechanical working often entails considerable tool wear. Long setting-up times and tool costs are the results. Moreover if the pipe parts are curved as well, such as in the case of the serpentine turns of an automobile exhaust manifold for example, then because of the less favorable accessibility a number of saw cuts at various clamp settings are often needed for a recess.

In order to lower the production time and production costs in the working of such pipe parts which have a complex spatial geometry, a system combination made up of a CO_2 laser and an industrial robot has been developed. The robot guides through the workpiece beneath the stationary laser-beam nozzle. Here the programmed space curve corresponds to the contour which is to be cut. At the same time the robot turns the part in such a way that the laser beam always strikes the pipe surface at right

angles. For a certain pipe part, the total machining time comes to about 80 seconds. The cutting process proper takes up only 20 seconds of that. For the same job a milling cutter takes about 18 minutes, inclusive of the idle-machine times. In addition there is the greater precision in the contours being cut arising from the laser-beam cutting process. This facilitates the welding of the pipe branchings and forms the prerequisite for automatic welding with a robot which is planned for later. The prerequisite for a high cutting accuracy is that the distance between the laser cutting nozzle and the workpiece surface, which amounts to only 1 mm, must be accurately kept to within $\pm$ 0.2 mm. A distance regulator with capacitive vertical scanning provides for this.

Raskin, Switzerland

Customarily, laser cutting machines have either a fixed head (workpiece is moved) or a mobile head (workpiece is stationary). The concept of the laser cutting center LRF 4201 unites the two functional principles, with this being designated a composite assembly.

- A simple and uniformly precise mounting of the machine is guaranteed thanks to the fixed-head principle.

- The cut parts remain on the machine baseplate without interfering with continued machining.

- Through cooling the cutting zone and evacuating the cooling fluid by a suction device, the cutting quality is improved.

The maximum machining size on this machine can amount to 2000 x 2500 mm with one resetting. The traversal path comes to 1,000 x 1,250 mm. The maximum material thickness which can be cut is up to 6 mm for metals and up to 25 mm for organic materials. Also the control system is adjusted to the specific requirements of laser cutting. This permits a continuous cutting-path concatenation, subroutine techniques, interleavings, and other program-shortening possibilities.

Spectra-Physics, United States, for Europe in Germany

Spectra-Physics has had a home in Darmstadt for more than 15 years. That is where the European activities are concentrated of this largest laser manufacturer in the world. This company has had the longest experience of all with lasers. The first commercially usable laser was developed at its central laboratory in California toward the beginning of the 1960's. The range of products offered here includes lasers both for research and for the industrial sector.

One newly developed piece of equipment is the machine 820 for the alternative tasks of either cutting or welding. This system is microprocessor controlled. This considerably simplifies the operation and monitoring. The operator merely presses the on-button and types in the desired laser power. The laser is ready for operation after 2 minutes. The gas filling and measuring-out process takes place in a fully automatic manner. The

laser power is actively regulated and is held constant during the entire operating time within a range of ± 2 percent.

For example, with a laser power output of 1.5 kW, one can cut high-grade steel in thicknesses up to 10 mm, tool steel up to 12 mm, high-strength steel up to 15 mm, and aluminum up to 5 mm.

Trumpf, Germany

Trumpf has combined laser cutting and the traditional mechanical punching and nibbling. For example, the laser/punching machine for the working of sheet-metal parts up to 6 mm thickness is designed as the core of a flexible sheet-metal machining cell. This machine is equipped with a robot which inserts and changes the punching tool in a matter of seconds. The providing of sheet-metal parts is done from a warehouse with high shelves. The finished parts are deposited next to the machine on two trucks. This pigeonholing takes place according to specific parts at programmed locations, so that the parts are immediately available for further processing. The total system, which has been shipped to the United States, permits a sheet-metal machining made to order. It avoids the relatively long warehousing of finished parts. This sheet machining cell is controlled by way of a master computer, the machine is provided with programs by way of a DNC [direct numerical control] hookup, and the tool life of the punching tools is automatically monitored.

Voest-Alpine, Austria

Voest-Alpine is one of the largest sheet-metal producers in Europe. In this company there are more than 30 years of experience with sheet-metal working as well as with the construction of sheet-metal machinery. Because of its comprehensive technological and metallurgical know-how, this firm is always able to offer its customers equipment embodying the latest state of the art in the field of sheet-metal working. And at present this unquestionably involves the use of lasers.

With its Valcut model, a modularly constructed laser cutting and punching system is offered which optimally fulfills a wide variety of machining requirements. The modular design is the very feature which makes it possible to have combinations of the various machine models: Valcut L uses a laser beam exclusively as a cutting-off tool. And this is useful in all situations where because of the form of the workpiece or the material properties a mechanical working is too expensive or is not possible at all. Or else wherever the small numbers of pieces involved simply make it uneconomical to fabricate the corresponding punching tools. For punching work there is Valcut P, a hydraulic punching machine, which gives the advantages provided by the CNC-controlled precision coordinate table developed for laser-cutting methods. Because of its uncomplicated design, it is especially suitable for use by sheet-metal processors dealing with small numbers of pieces. Valcut LPC, the laser cutting and punching center, combines laser cutting and punching in the most economical way, quite simply through the combination of Valcut L and P.

12114
CSO: 3698/588

THOMSON TO SET UP TWO NEW AUTOMATED IC ASSEMBLY PLANTS

Aix-les-Bains Plant

Paris ELECTRONIQUE ACTUALITES in French 20 Apr 84 pp 1, 19

[Article by J. P. Della Mussia]

[Text] Following the acquisition of Semiconducteurs Alcatel by Thomson-CSF in November, the Aix-les-Bains plant which currently manufactures gate arrays and which continues to serve the former customers of Semiconducteurs Alcatel, will at the same time become a large facility for automatic assembly and packaging of integrated circuits (IC) in 24-pin and larger plastic cases, for the needs of Thomson Semiconducteurs.

A 30 million francs investment program has just been launched to purchase equipment that will make it possible to assemble more than one million IC's by the end of the year, and then "tens of million per month" at the end of 1985. At that time, most of Thomson's complex MOS and bipolar IC's will thus be packaged in France. According to the company, due to the present exchange rate for the dollar and to custom regulations, assembly in France will enable it to reduce packaging costs by 10-15 percent.

A Problem of Cost

The repatriation of semiconductor assembly operations in Europe is an old story which has become increasingly topical through the years, depending on the degree of automation achieved by bonding machines developed by the semiconductor companies themselves, or by specialized companies.

In Europe, the unchallenged champion of bonding on home grounds is ITT Semiconductor/Fribourg (with its Colmar subsidiary). But TI has also been assembling for a long time in its Portugal plant, and for some circuits, in Nice. For the past year however, initiative in this field has bloomed: Telefunken Electronic has automated the assembly of all its displays at DEL, as well as the bonding (but only the bonding) of its TO3 and TOP3 power transistors; SGS, in Catane, has been operating for the past six months the first entirely automated (up to marking) assembly line for TO3 transistors.

Siemens' Villach plant has about ten automatic bonding machines to handle part of its production; and lastly, Motorola has started a very large assembly automation program in its Scotland plant. This sudden repatriation of assembly to Europe has two underlying causes: a spectacular rise in the exchange rate of the dollar, which has correspondingly increased the cost of assembly in the Far East; and the availability of automatic bonding machines with image recognition, which have demonstrated their worth.

But Thomson has other good reasons for assembling at Aix-les-Bains:

First of all, experience has shown that assembly close to a manufacturing plant leads to better product reliability; transportation and aging before packaging are not favorable factors for assembly in the Far East; at Aix, all the packaging will be carried out in clean rooms;

Secondly, manufacturing time is reduced (10 days for packaging at Aix-les-Bains, compared to six weeks in the Far East), which is reflected in product prices; moreover, during periods of high demand there are no unpleasant repercussions from unavailable subcontractors;

And lastly, final tests can be performed on the spot.

To these ends, a new investment of the order of 30 million francs will be launched at Aix during the third quarter.

Starting With 24 Pins

At Aix, Thomson will use only its DIL 24-28-48 and 64-pin packages, and later, Surpicop (plastic chip-carrier) packages. The company is continuing the robot development that began at Eurotechnique, for transferring parts during various assembly stages, so as to achieve maximum automation for the entire assembly line.

Under current conditions, the profit limit for automatic assembly in France is at about 18 or 20 pins. But the bulk of the production at Thomson-Semiconducteurs (tens of million units per month) is between eight and 18 leads (memories, op-amps, and so on). The group is therefore examining the possibility of also assembling this type of circuit in Europe, if not in France.

Lorraine Plant

Paris ELECTRONIQUE ACTUALITES in French 4 Mar 84 pp 1, 14

[Article by J. P. Della Mussia]

[Text] Only several days after Thomson-Semiconducteurs announced the creation of an automatic assembly and test unit for IC's with more than 24 pins, at the former plant of Semiconducteurs Alcatel (ELECTRONIQUE ACTUALITES of 20 April 1984), Laurent Fabius, minister of industry and research, indicated that Thomson would create an assembly and test plant for IC's with less than 24 pins, in Lorraine this time, at a site that has not yet been specified.

For several months already, Thomson-Semiconducteurs had conducted studies to compare the profitability of assembly and test operations in various European countries with salaries lower than those in France (among which Malta, Ireland, and Scotland). Under its current economic conditions, France does not "pass" for circuits with fewer than 18 pins. But Thomson-Semiconducteurs had nevertheless presented the government with a list of conditions that would have allowed Lorraine to become a candidate for locating the planned installation. These conditions have apparently been accepted. Among them are an authorization to operate the plant 24 hours a day and seven days a week, as well as promises for waivers regarding night work for women, creating a very significant precedent which could trigger the listing (or relisting) of France among possible foreign locations for American and Japanese components companies.

Profitable Production At Home

Under present conditions and all things considered, the assembly and testing of semiconductors is at least 15 percent more expensive in France than in Scotland for 16 to 20-pin circuits. Only three factors are available to offset these 15 percent: ammortize very expensive installations 24 hours a day (in Scotland, plants can now operate 24 hours a day up to 361 days per year), shift some of the plant construction cost to the region or to the government, and reduce the salary charges to be paid by the employer. All three appear to have been invoked in Lorraine. Given Thomson's (unofficial) satisfaction, it is even possible that under present circumstances Lorraine has become more interesting than Scotland or Malta.

According to a generally well informed source, the Lorraine plant, whose construction will begin as soon as public funds are made available (it is not possible to be more specific), will ultimately represent an investment of several hundred million francs and will cover 80 percent of the needs of Thomson Semiconducteurs for circuits with less than 24 pins.

Officially, the plant will (eventually?) have 460 employees, 120 of which will be engineers and technicians. Considering the desired, and probably planned level of automation, these figures seem very high, unless they correspond to

an assembly plant which would meet the 1990 needs of Thomson Semiconducteurs, with a planned turnover of 10 billion francs per year (seven times the current revenues). We might remember that Thomson Semiconducteurs was supposed to invest at least 8 billion francs by 1990 to achieve its goals.

It is now official that this year, Thomson Semiconducteurs will allocate 650 million francs to semiconductors (we had earlier assumed that this sum could be 600 million, see ELECTRONIQUE ACTUALITES of 16 March 1984). The investments alone (the remainder being used to plug at least part of the 1983 losses) will be three times larger than those of last year. Assuming an investment of 150 million francs in 1983, this could leave an investment of 450 million for 1984. This amount would be lower than the about 600 million francs that Thomson should invest during this year in order to pursue its development plan; but it does not include the Lorraine plant, which will probably not be relatively expensive for Thomson Semiconducteurs, but which will still correspond to an investment.

We might also remember that automatic assembly and testing in France allows a French company to improve product reliability, reduce manufacturing times, and additionally, to plan its costs in francs independently of rates of exchange (see ELECTRONIQUE ACTUALITES of 20 April 1984).

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OFFICIAL OF METALLWERK PLANSEE OF AUSTRIA ON U.S. CRITICISM

Vienna DIE PRESSE in German 3 Aug 84 p 10

[Interview with Dr Rudolf Machenschalk, chairman of the board of Metallwerk Plansee, Ltd, by Monica Riedler, in the column "This Week's Interview": "No Infraction of the Embargo"; date and place not specified]

[Text] [Question] Plansee is being sharply attacked by the Americans in connection with the transfer of technology to the East. What do you feel about that?

[Answer] Basically we find this attack very surprising and really can't explain it. The primary function of our enterprise is the solution of technical problems by means of special materials or in some cases by developing materials. This requires very close and confidential cooperation with our customers as partners. We have maintained this policy for decades and it has made us successful in the international market.

[Question] To what do you attribute these criticisms at the present time?

[Answer] Right now we are trying to clarify this matter. I have tried to establish contact via the American Embassy and we shall try to uncover the reasons for this situation and its causes through our American business office and our subsidiary.

[Question] Such attacks could have a damaging effect on your business. Is your firm going to take measures against the newspaper or respond to such charges?

[Answer] As long as we don't know why these attacks have been made against us there cannot be any consequences. In this connection I should like to say that there hasn't really been a direct attack but the literal content of the article was to the effect that official circles in the United States are nervous because of Plansee's production capabilities in the area of powder metallurgy.

[Question] Does Plansee receive technology from the United States?

[Answer] No, we receive neither direct technology nor know-how from the United States. On the contrary we have contracts with American companies

which provide for joint developments and are intended to make possible the use of these developments or their conversion into commercially useful applications in the United States.

[Question] What do the Plansee plants export and where to?

[Answer] Our export quota has a very high value of 93 percent with the greatest portion of our sales being in the FRG; the United States is in second place with respect to our sales and Japan in third place. In the CEMA countries we export barely 15 percent. Our exports to the USSR are extremely small and amount to only about 1 percent.

[Question] What products do you export?

[Answer] We export primarily two product lines. The first line is high-melting-point metals, tungsten, molybdenum, tantalum and niobium, primarily in unfinished form, in other words sheet metal, wires, rods but also sometimes in the form of apparatus. The second product line which we export consists of hard metals for noncutting and free-cutting metalworking of steel and steel alloys.

[Question] Dr Machenschalk, the Plansee plants have already been previously mentioned in connection with armament industries. Which of your products are of importance in this sector of industry?

[Answer] These special metals because of their characteristics are in demand in the most varied branches of industry: medicine, electrotechnology, electronics, chemical technology, petroleum technology and also in defense technology. In most cases we do not have any idea where our products are being used. If they are being used at all in the armament industry then that use is primarily indirect.

[Question] Is it basically possible for a company to keep track of the use to which a customer puts its products?

[Answer] Essentially it is not possible. But fundamentally we abide by the export regulations which are in force and have been in force in Austria, in particular as they affect exports to the East.

[Question] Is your company subject to any controls with regard to export?

[Answer] Apart from the embargo regulations which are in force in Austria our enterprise in Austria is naturally subject to no controls whatever. The embargo regulations themselves are regulations which make approval by the Austrian authorities obligatory for the export of products which are clearly intended for the armaments industry.

[Question] Are any of the products of your firm subject to these regulations?

[Answer] According to current opinion our products are not subject to these regulations.

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CSO: 3698/560

OECD STUDY CONCLUDES TECHNOLOGY EMBARGO NOT CALLED FOR

Zurich NEUE ZUERCHER ZEITUNG in German 26 Jul 84 p 11

[Text] Paris--For quite some time now, the question of whether the West should do business with the Eastern Bloc has been answered in a relatively pragmatic way by means of the trade policy followed. In the case of consumer goods and merchandise having a small technology component, the almost universal view is that this question is not very problematic here. The almost unanimous verdict is that in this case the economic benefit which the exporting countries derive from this and the nation-linking aspect of the trade--whatever the restrictions may be--are more important than the counterarguments to such a trade.

On the other hand, the exporting of capital goods to the East is more controversial, since in the opinion of opponents of such exporting this permits the East to reduce its technological lag behind the First World and allows a military utilization in connection above all with many goods imported from the West. With the Coordinating Committee for Multilateral Export Controls (Cocom), which just recently tightened up on its list for "dual use items" (see NEUE ZUERCHER ZEITUNG No. 165), NATO has provided itself with an instrument for keeping this exporting of technology somewhat under control, although for entirely pragmatic reasons exceptions to the "export prohibitions" stipulated in the list are found again and again. For Switzerland this aspect of Eastern trade policy is especially important, because it is neither a NATO member nor a Cocom member, but nevertheless in its exports to the USSR, according to an American study (Gary K. Bertsch, "East-West Strategic Trade, Cocom and the Atlantic Alliance," Paris 1983) it shows an especially large proportion of highly technological goods. Thus it is the fifth most important supplier of advanced technologies to the USSR, even ahead of the United States.

Less a Matter of Capital Goods...

Now an analysis prepared within the framework of the OECD series of studies on "East-West Technology Transfer" comes to the conclusion in its macroeconomic first part (Stanislaw Gomulka/Alec Nove, I, "Econometric Evaluation of the Contribution of West-East Technology Transfer to the East's Economic Growth," OECD 1984)--which will undoubtedly give rise to debates--that technology transfer in the narrower sense, namely through the sale of equipment and machinery, is not of great relevance, and therefore

by the same token an embargo does not make much sense either. This verdict on the restrictions in Eastern Bloc trade being demanded again and again by the United States above all is justified by the two authors in turn through an analysis of various macroeconomic studies of an econometric and quantitative nature. The bulk of these studies concentrates above all on the transfer of machinery--probably because it is easiest to measure the effects in such cases--and on a single country, the USSR. The consequences of such material technology transfer are considerable, according to these studies. Thus, according to some results Western machines are occasionally ten times more productive per ruble spent than their Soviet counterparts, and this represents a contribution to the growth of the USSR which is not negligible, especially since the proportion of Western machinery in the USSR's total stock of equipment comes to at least 5 to 6 percent, and is said to be even higher than this in the other Eastern Bloc countries.

Than a Matter of Scientific Exchange

However, the earlier studies of one of the coauthors of the OECD report, Gomulka, go beyond the object of investigation of the rest of the studies and include other Eastern Bloc countries as well, particularly Poland, and also "invisible" technology transfer--that is, that which is not embodied in machines. With this as a basis, the OECD report comes to the conclusion, while using a cautious scientific mode of expression, that there is a strong possibility that the purchasing of capital goods is not the most important channel the Soviet Union has for acquiring Western technology and know-how. It says that the direct purchasing of know-how or of licenses makes it possible for the Soviet Union to accelerate and to stimulate its own research and development processes. Moreover Moscow is procuring scientific and technical publications in the West on a large scale and is availing itself of every opportunity to study the advances being made in the West. The authors believe that it is very difficult to control these kinds of practically unlimited access to Western knowledge.

In comparison to this, the direct contribution of the capital goods trade to Soviet growth is presumably relatively small. Moreover, in the opinion of the authors the Soviet Union would try to produce for itself, by a massive employment of funds, any technology viewed as truly important. They say that practically speaking this is always possible--with varying amounts of outlay--except for the most recent technology at the time in question. Therefore an embargo could create certain problems for Russia in the short run, but it could not fundamentally call into question its technological progress.

The second part of the same OECD book, an analysis of various macroeconomic case studies (George D. Holliday, II, "Survey of Sectoral Case Studies," OECD 1984) comes to an almost contrary verdict, in the sense that in the industries or firms studied an important contribution on the part of Western machinery to their technological advancement can be established, despite all the problems of assimilation involved. The author believes that he sees the reason for this as lying in the fact that the sectors studied have been above all those which were provided with Western technology by the Eastern planners on a priority basis, and that naturally enough in these areas the contribution to growth is relatively high.

Nevertheless, he says, this contribution remains slight for the national economies as a whole.

The Smaller CEMA Countries Are the Ones Which Suffer

A second central proposition resulting from the macroeconomic study of Gomulka/Nove, which consciously regards itself as non-political, is that the importance of capital goods imports from the West is considerably greater for the smaller CEMA countries than for the Soviet Union. These countries themselves possess only comparatively minor research and development capacities and therefore are more dependent on imports. Accordingly a general embargo against the East--for individual products or across the board--will affect the smaller countries more than the USSR. The authors develop these thoughts further. They point out that an embargo on technology exports would decrease the pressure toward economic reform for the smaller East Bloc states. That is, because of their greater dependence on the West they also have to be more export-oriented, they have to strive more for competitiveness and efficiency. An embargo would change this situation and drive the Eastern Bloc states into a greater technological integration with the Soviet Union.

Permanent Lagging Behind Due to the Nature of the System

Gomulka and Nove stress again and again that the contribution of Western technologies to the growth of the Eastern Bloc must not be overrated, above all for the reason that in the last analysis there is an absence of absorbing capacity in the East. The study by Holliday provides plenty of illustrative material for that. The microeconomic case studies assembled there show that in the Eastern Bloc the time between the purchase of a machine and its satisfactory functioning often takes two to three times longer than in the West and can lead to the situation where an imported technology is already obsolete again at the moment it is put into initial operation. Furthermore, there are reports of factories which need to operate with 50 to 70 percent more employees than in the West, of branches of industry where the productivity of labor reaches only about two thirds of that in the West, and of a utilization of capacity which is 20 percent lower than in the West. Diffusion as well proceeds only very slowly. Therefore the Eastern system in its totality is a greater drag on technological progress in the CEMA countries than any embargo. This is the case to such an extent that Gomulka and Nove doubt whether through the purchase of machinery and scientific publications in the West the USSR ever makes up what it loses through its self-desired isolation. Thus the East is a hindrance to its own self, and since the chance of even a moderate change in the system is not very great, the two experts also do not believe there will be a diminishing of the technological gap. In individual sectors, this gap runs to as much as 10 years.

12114
CSO: 3698/583

SWISS ATTITUDE REGARDING PROPOSED COCOM EMBARGO MEASURES

Zurich NEUE ZUERCHER ZEITUNG in German 29/30 Jul 84 p 11

> [Text] Switzerland does not have any influence on the specific shaping of the technology embargo against the members of the Warsaw Pact which has been decided on within the framework of Cocom. Yet it cannot get away from taking these strategic-political circumstances into account in its own foreign-trade policy and engaging in its own export control with meticulous care.

Bern, 27 July--As has been reported already in the press (see NEUE ZUERCHER ZEITUNG No. 165), those NATO states which are associated in the Coordinating Committee for Multilateral Export Controls (Cocom) plus Japan have agreed on a new list of data processing and telecommunications equipment usable for civilian and military purposes which are to be withheld from the Eastern Bloc countries. This revised embargo list is not yet operational. The policy decisions must first be ironed out, which probably will take some time yet, because the technical specifying and classifying of the equipment is becoming more and more difficult.

Import Certificates Since 1951

Switzerland is not a member of the Cocom, nor does it maintain any official relations with this organization. But the individual members brief Bern as to those decisions which are adopted in the national law of the separate member states and which thereby become relevant to Swiss foreign trade in terms of of bilateral commerce. Purchases of strategically important goods are made dependent on whether the importing country wants to and can offer a guarantee that the products will not be reexported without the consent of the supplier country. In order to ensure that Switzerland continues to have opportunities to purchase such goods, ever since 1951 the Swiss authorities have issued import certificates, on the basis of which the applicants commit themselves beforehand to import the merchandise into Switzerland and not to export it again without authorization. With the aid of this import certificate, the foreign supplier can apply for an export license in his own country, without which he may not engage in exporting.

This mechanism is regulated in the decrees "On the Monitoring of Imports" and "On the Export of Goods" which have as their basis the Federal Law

Concerning Foreign-trade Measures. The latter contains in an appendix a list of those goods whose exporting is subject to the obligation to obtain authorization. As a result of technological developments, changes are made in the list of those goods which are being released only conditionally for export by the export-restricting countries.

The commitment made by the Swiss importer to refrain from reexporting can be monitored only if an obligation to obtain authorization is placed on any exporting of those goods for which the supplier country requires a final destination statement. This officially monitored export authorization obligation represents a control measure for checking the origin of the goods and for ensuring adherence to commitments entered into with respect to non-reexporting. Moreover, as the authorities describe it this export control also helps to implement our traditional, neutrality-motivated foreign trade practice of not undermining trade-restricting measures of other exporting countries through shipments from Switzerland. Therefore the responsible Federal agencies also are opposing attempts to transfer producing plants from foreign countries into Switzerland for the purpose of circumventing Cocom restrictions. Switzerland autonomously decided on these measures, but it is obvious that it had no other choice if it did not want to take a chance on serious hardships for the Swiss economy.

The United States: A Sensitive Partner

Strategic export control plays an especially important role in foreign-trade relations with the United States; after all, most of the ultimate-use declarations for products are issued by this country. In their national regulations the Americans often go beyond the Cocom recommendations, with of course the development and application of laws in the United States being stamped by the sharp rivalries within the administration and between the executive branch and Congress. These conflicts never have to do with the fundamental question of the desirability and utility of an embargo, which is not disputed, but rather with the concrete shaping of this trade-policy instrument. The Pentagon goes the farthest; there, on the basis of arms-policy criteria a very extensive list is compiled of all those goods which are needed by the Soviet army but which presumably cannot be produced at all or can be made only under less favorable conditions in that country itself. And although the Department of Commerce has a greater appreciation for overall economic considerations and for problems of practical feasibility, in this civilian branch of the administration as well export prohibitions are viewed as practical even when shipments which cannot be completely prevented are nevertheless at least made more expansive and are delayed.

Clearly this is the atmosphere from out of which has grown the distrust of those European countries which do not belong to Cocom. Therefore one of the ongoing tasks of our diplomatic representatives in Washington is the discreet, patient, but determined explaining to the influential and responsible authorities there that Switzerland does not want to profit from the restraint exercised by the Cocom states, but rather by way of an efficient monitoring system is fighting against and also successfully preventing circumvention operations. In the judgment of informed

diplomats, given this background the illegal transfer of American goods by the Neuenburg firm Favac AG which was uncovered last year at least had the advantage of showing to the Americans that the Swiss authorities are determined and able to enforce their regulations.

Therefore this cultivating of American trust in the efficiency of the Swiss licensing, control, and criminal-prosecution mechanism has a high priority for Switzerland at the present time, because the bills pertaining to the Export Administration Act, on whose final legal form the Congress will decide, and to the revised ordinance on retailer licenses of the Department of Commerce are formulated in a very restrictive way and provide for more stringent standards for non-Cocom members.

Trade Policy Discrimination?

The danger exists of a discrimination against those states not associated with Cocom; after all, according to the above notions the reexporting of an American product without special authorization from the United States would be possible only for Cocom states. The additional technical and administrative expense of such a regulation would inevitably result in a considerable delaying of the conduct of business, with the foreseeable financial consequences for the Swiss export trade and its competitiveness. Contravening firms would undoubtedly be placed on the Denial List, the blacklist, and would have to expect sanctions which may extend as far as the total banning of business relations of any sort and an embargo on imports.

If this hard line were to really prevail in the United States and the Swiss self-monitoring were no longer viewed as reliable enough, the extra-territorial right of control already claimed by the United States under current law would take on an even more practical significance. According to the interpretation of the law in the United States, the Federal authorities in Washington consider it to be self-evident that they can check to see that the rules of conduct imposed on U.S. firms are also being applied in foreign countries--something which if strictly implemented would inevitably have to lead to collisions with the Swiss notion of legal sovereignty. Up to now this potential for conflict has not been critical, because the rigorousness and efficiency of the Swiss export controls have been recognized, and in the opinion of the Swiss authorities this proof of performance also continues to justify not showing any discrimination against Switzerland compared to regular Cocom members.

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